AD-A021 888

MANAGEMENT LEADERSHIP IN SYSTEM MEASUREMENT BEDS

J. E. Uhlaner

Army Research Institute for the Behavioral and Social Sciences
Arlington, Virginia

August 1975

MANAGEMENT TRAINING IN SYSTEM MANAGEMENT

U. S. Army

Research Institute for the Behavioral and Social Sciences

August 1975

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Technical Report S-3	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) MANAGEMENT LEADERSHIP IN SYSTEM MEASUREMENT BEDS		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) J. E. Uhlaner		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences PERI-ZT 1300 Wilson Blvd, Arlington, VA 22209		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Deputy Chief of Staff for Personnel Washington, D.C.		12. REPORT DATE August 1975 13. NUMBER OF PAGES 20
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Leadership behavior
Management leadership
Systems measurement
Officer Selection
Human performance variables
Officer evaluation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The U.S. Army's over 30 years of research dealing with measurement, understanding, prediction, and development of managerial leadership behavior confirms that the effectiveness of a unit or group depends critically on its leader or manager. A great many variables interact in effective leadership. These may be analyzed as parts of several different but interwoven systems, of which one of the most basic is the distinction between cognitive and noncognitive aspects of human performance. The cognitive deals with logic and facts that are demonstratably right or wrong; the noncognitive deals with values and

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

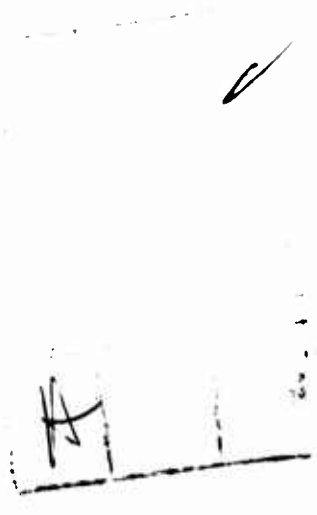
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. emotionally colored value judgments. A second basic distinction is in style of management--"authoritarian" vs. "participative"-- and its interactions with other factors.

For effective work performance, men must be appropriately 1) selected and 2) trained, and 3) in an appropriate work environment. Cognitive aspects are dominant in selection and school tests, school training, and human factors engineering at the workplace; noncognitive aspects are dominant in selection ratings and rankings, situational training experience, and organizational variables at the workplace. Simulated situational measures developed to study individual parts of the complex system comprise the system measurement bed.

Such systems research has differentiated two primary domains of Army leadership, combat and technical/managerial. These can be subdivided into eight general factors, of which the first six are dominantly noncognitive in nature: 1) technical/managerial leadership; 2) combat leadership; 3) team leadership and 4) command of men in the combat domain; 5) mission persistance, which cuts across both domains; 6) executive direction, in the technical/managerial domain; 7) tactical staff skills, in the combat domain; and 8) technical staff skills, in the technical/managerial domain. However, cognitive factors were better predictors of performance in technical/managerial situations, as noncognitive motivational variables were better predictors in combat situations.

The system measurement test bed, then, can be used to study selected interactions of utilitarian variables to produce specific usable findings, in this case for the Army's leadership management program.



TECHNICAL REPORT S-3

AD

MANAGEMENT LEADERSHIP IN SYSTEM MEASUREMENT BEDS

J. E. UHLANER

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

Office, Deputy Chief of Staff for Personnel
Department of the Army
1300 Wilson Boulevard, Arlington, Virginia 22209

August 1975

CONTENTS

MANAGEMENT LEADERSHIP IN SYSTEM MEASUREMENT BEDS

Over a long period of time, the US Army has made a very substantial investment in research dealing with the measurement, understanding, prediction, and development of management leadership behavior in a great variety of combat and technical/managerial environments.

It is my view that the investment is particularly justified when one considers the cumulative findings of three decades. I was most impressed with the empirical results of a study dealing with the effectiveness of squads which took into account a huge number of variables, too numerous to detail here. The dramatic conclusion was that the major portion of the explained variance of squad effectiveness was attributable to the effectiveness of the squad leader. Since that early study, other research efforts have reinforced the important and critical contribution made by the management leader, whether in a combat situation or in a technical/managerial leadership situation, with respect to the execution of the overall mission by the entire team or unit. Over the years, the classes of significant variables in the management leadership situation have emerged and are almost overwhelmingly numerous and complex. One is dealing with a greater complexity of variables here than for most problems. Minimally, the concern with the management leader is in relation to his group or team: its functions, its cognitive and noncognitive characteristics, his aptitude and experience and knowledge; the style that he has developed or the style that may be imposed by the system in which he and his team are embedded--the pattern of supervisory behavior; the characteristics of the tasks and the jobs to be performed; the characteristics of the individual members of the group; the job environment (whether stressful or nonstressful); the situational and organizational climate (whether authoritative, permissive, or mixed); the missions to be accomplished (whether specific and short term or broad and ambiguous); and methods of enhancing group morale. Figure 1 lists the variables just mentioned, along with implied hypotheses relating them to high or low management leadership effectiveness as a function of leadership style.

These and many more variables make for a rich research base which has not only intrigued dozens of research psychologists, but has led to fairly large research programs, including a few in industry, to examine various questions relating to management leadership.

There has been considerable professional coordination between the research that has been carried out in the US Army environment and research that has been carried out under the auspices of American industry, particularly as related to assessment techniques and measurement methods. In industry, studies that come to mind are the long-term AT&T study of

Pattern of Supervisory Behavior or Style	Characteristics of Tasks & Jobs To be Performed	Employee Characteristics	Job Environment	Situational Organizational Climate	Goals	Enhancement of Group Morale
BENIGN AUTHORITARIAN [1]	Tasks and jobs highly structured	Relatively unskilled	Stressful	Authoritarian	Specific and definite	Rewards given as "goodies"
Job-centered High initiating structure Firm but fair instructions and discipline Consistent behavior	Routinized and amenable to automation "Human engineering" tends to be applicable Jobs tend to be frozen Short training requirements	Relatively uneducated Relatively rigid and compulsive Anxious and insecure Good followers	Rapid response required Monotonous "High initiating structure" Physical and psychological fatigue more common	Acceptance of authoritarianism as way of efficient production Often many layers and "boxes" Emphasis on initiating structure for efficiency	Short term Group goals common Deadlines and production measures important	Fairly concrete rewards and punishment: group progress highlighted (lower end of need hierarchy) Organization provides supervisors high in initiating structure Group cohesion through extracurricular activities Unambiguous instructions and objectives Fringe benefits
DEMOCRATIC, PARTICIPATIVE, OR EMPLOYEE-CENTERED [2] High consideration for employee	Structure of tasks looser Problems defined by employee Opportunity for ego-involvement, self-actualization Intrinsic motivation Extensive training requirements	Creative, highly versatile, educated Independent broad thinkers; want to help set goals	Non-stressful Liberal time requirements Can be exciting and interesting Low level of fatigue	Democratic Employees resist being fitted into a mold Few layers Emphasis on effective interpersonal relations	Broad, even ambiguous Long term Goals usually acceptable to followers Group goals and individual values may conflict	Emphasis on intrinsic motivation Reward & punishment at upper end of need hieratchy: individual progress recognized through status and prestige Tolerance of individual values: employee participation in setting of general goals Group cohesion by specialty of work

"High" leaders [3] use appropriate behavior style and content, and initiate structure effectively, taking into account the characteristics of the tasks, of those led, and of the situation–applying the correct amount and type of consideration. [4]

[1] Tyrannical authoritarian leadership can be considered a sick form, or it could be looked at as the extreme of no consideration.

[2] Laissez faire leadership is no leadership at all.

[3] High from a Systems Psychology point of view–neither authoritarian nor democratic is better in a vacuum; rather, the job, the situations, and the employees must be considered against a criterion fashioned to "predict" specified outcomes, such as high productivity, high morale, minimum turnover, minimum grievances. Even within a given situation, different styles of behavior may be equally effective.

[4] Supervisor's role with respect to consideration affects the outcome like a moderator variable.

Figure 1. Classes of variables significant in management leader situations

managerial lives by Bray, Campbell, and Grant,[1] and the work at Ohio State University, including the doctoral dissertation and additional efforts by one of our former ARI associates, Dr. Edward A. Fleishman.[2,3]

Considering the complexity of the topic, I will discuss only a select number of major findings from Army efforts. I find it not only helpful but necessary to deal with several models in order to present these findings in proper perspective. These models are as follows:

1. Previously discussed conceptualizations of interactions of human factor system variables as related to human performance effectiveness. See Figure 2.

2. My discussion and conceptualization of cognitive and noncognitive aspects of jobs, particularly as they relate to the job of the management leader who has high noncognitive job demands.[4]

3. Our many years of involvement with a differential classification model which, in short, did not assume a general monolithic factor of leadership behavior but, rather, differential talents and requirements.

---

1 Bray, Douglas W., Campbell, Richard J., and Grant, Donald L. Formative years in business: Longterm A.T. & T. study of managerial lives. N.Y.: John Wiley & Sons, 1974.

2 Fleishman, E. A., Harris, E. F., and Burtt, H. E. Leadership and supervision in Industry. Research Monograph, No. 33. Columbus, Ohio: Bureau of Education, 1955.

3 Fleishman, E. A., and Harris, E. F. Patterns of leadership related to employee grievances and turnover. Personnel Psychology. 1962, 15, 43-56.

4 A brief review of what was presented previously by this writer with regard to cognitive and noncognitive aspects of jobs seems in order. As a working definition, the cognitive content of a job consists of right or wrong responses, while noncognitive content has an ad hoc quality consisting of styles of behavior and value judgments often subjectively determined. The latter behavior interactions influence the individual or organizational goals and relate to individual or group hypothesized expectancies.

When I speak of the cognitive content of a job, I am concerned with a right or a wrong response to a stimulus. Once a few rules are set, most observers would agree to the number of X's on a screen, or to the correct sum of a column of figures, or to a particular solution to an equation. Of course, the rightness or wrongness is not absolute. The probability that the consensus is correct may be set at some agreed-upon high p, or say .99.

It is my contention that when we speak of the noncognitive content of a job, we should deliberately depart from the cognitive concept of rightness or wrongness. In the noncognitive domain, we are confronted with a host of value judgments--colored by emotionality--which in the abstract are neither right nor wrong, correct nor incorrect. Many of these value judgments tend to be bipolar in concept. For example, a person may use power or conciliation in attempting to achieve certain ends. Quantity may be viewed as preferable to quality or quality preferable to quantity. Daring and risk-taking may be preferred over care and caution, or vice versa. For many of these styles of behavior, there is usually a good or a bad connotation situationally which can easily reverse with intensification of the behavior. Daring and risk-taking may change to recklessness; caution may change to timidity. Moreover, it is felt more useful to replace the general concepts of caution, forcefulness, and other such styles of behavior or traits with more specific concepts, such as forceful command of men in combat or cautious approaches to design of experiments.

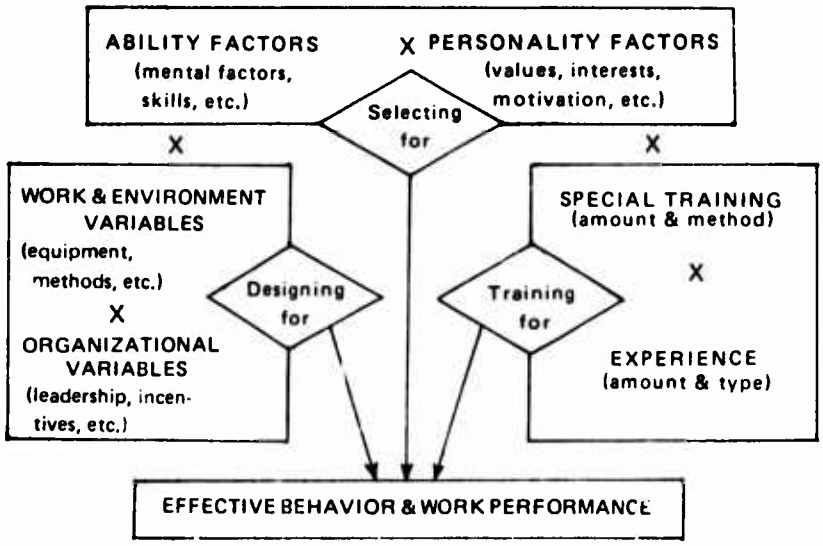


Figure 2. Conceptualization of interactions of human factor system variables as related to human performance effectiveness.

The Army research program in this area in recent years has been conducted to provide the Army with research-based results to be applied to the following major objectives, all of which are concerned with improving effectiveness of the officer personnel system:

1. To provide US Army personnel management with scientific measurement procedures for identification of young men and women with high potential for management leadership in military settings.

2. To develop methods of identifying cadets or young officers with potential for military leadership careers, consistent with the recent Army Research findings, particularly in combat commands as contrasted with technical/managerial commands.

3. To assist the US Army in devising and quantifying methods for evaluating officer performance in first tour assignments, and for estimating potential for higher and more demanding assignments.

4. To develop techniques to assess motivation for a military leadership career and to enhance career motivation through appropriate early assignments.

Quite early in our research program it was fairly evident, as indeed it has been to other investigators, that the management ability factors we were dealing with were at least of two kinds: (1) they indeed had to deal with the cognitive aspects previously defined in this paper, and with cognitive aspects as they were related to job content. In short, the military officer must know the technical side of the work,

whether it is technical/managerial or combat activity, and whether it is work that he personally performs or work that his subordinates do. (2) The other type of management ability factor was probably largely non-cognitive, but even here considerable cognitive interaction is obvious. More specifically, a management leader has additional requirements for effective, face-to-face interaction for motivating his team or group, for effectively communicating, evaluating his men, and rewarding and punishing. As indicated in Figure 1, effective leaders must use appropriate behavior style and content and must initiate structure effectively, taking into account characteristics of the tasks, of those led, and of the situation--applying the correct amount and type of consideration.

Our earliest findings, indeed, indicated that there was predictive validity for cognitive measures. For the achieving of skill in cognitive functioning we repeatedly found predictive validity for higher level intelligence tests against Officer Candidate School (OCS) class standing or grades, or for ROTC likelihood of graduating. Further, as early as the fifties, we began to get predictive validity for Army performance through use of peer ratings which far exceeded the validity of specially designed cognitive intelligence tests. This is well known now, but the point I want to emphasize is that the kind of predictors which finally yielded useful validity, at least in the management leadership situation, obviously have a large noncognitive component. It became evident that, on a measurable basis, it was the noncognitive domain that needed research attention. Let us return to the earlier model, represented by Figure 2. This figure points out the highly interactive nature of the variables that need to be considered in the evaluation of the leadership situation. Figure 1 abstracts a few of these interactions with emphasis on style of leadership. But irrespective of the specific situational model, it becomes evident that management leadership research must find a way to pinpoint significant variables, as in Figure 1, and deal with selected interactions while relating to reality as much as possible since the order of interactions could indeed be huge. My colleague, Professor Lee J. Cronbach of Stanford University, has stated: "In attempting to generalize from the literature, Snow and I have been thwarted by the inconsistent findings coming from roughly similar inquiries. Successive studies employing the same treatment variable find different outcome-on-aptitude slopes. Some fraction of this inconsistency arises from statistical sampling error, but the remainder is evidence of unidentified interactions."[5] Quoting further from his distinguished address, "In the personality field [and in the management leadership area we are certainly concerned with personality] it is neglect of interactions that has kept alive the battle between the 'situationists' and the trait theorists."

---

[5] Cronbach, Lee J. Beyond the two disciplines of scientific psychology. Distinguished Scientific Contribution Award address presented at the meeting of the American Psychological Association, New Orleans, September 1974.

The resolve to maximize interaction effects in exploitation of the various concepts discussed above very much influenced the Army's research in the sixties. ARI took experimental measures on officers immediately after their entry on active duty and obtained performance evaluations at subsequent points in their careers with situational synthesized test bed measures, which we developed as special experimental tests, hypothesizing differential measurement, to achieve differential prediction of the various domains of management leadership. The tests were administered to large samples of officers--one sample of 6,500 in 1958-59 and another of about 4,000 in 1961-62. From the sample of 4,000, 900 officers were selected as representative of various branches of service to take part in an ARI experimentally-controlled 3-day exercise at the US Army Officer Evaluation Center (OEC). Figure 3 presents the first, second, and third days' activities at the OEC. The problem situations allowed reasonably objective data to be recorded on specific details of each officer's performance, as well as judgmental evaluations of his style of behavior and effectiveness in aspects of each task and in each situation, all of which was consistent with the Cronbach philosophy of taking account of interactions. Our situations were appropriately realistic; they had content validity; and they were carefully sampled from the three broad domains, management leadership in combat situations, management leadership in technical/managerial situations and technical/managerial leadership in administrative situations. The third eventually collapsed into the other two.

In addition to obtaining the evaluations at the OEC, sometimes referred to as the Assessment Center, ratings of all officers who had taken the Differential Officer Battery (DOB) were obtained in their work assignments. The first evaluation ratings were made by superiors and associates after the officers had been in their duty assignments for 12 to 18 months. In 1967-68, various evaluations of performance were obtained for officers of the original sample on duty in Vietnam, Europe, Korea, and within the Continental United States. These various evaluations have been used in interpreting the results and measures employed at the OEC.

When we correlated rated performance in combat, administrative, and technical duties on first duty assignment with performance in combat, administrative, and technical exercises of the OEC, we found that combat command exercises correlated an average of .26 with combat duty performance, .05 with administrative duty performance, and .02 with technical performance. On the other hand, technical/managerial exercises correlated .21 with technical/managerial duty performance, -.01 with administrative duty performance, and .17 with combat duty performance. Administrative exercises in the OEC correlated .13 with administrative duty performance, .14 with technical/managerial duty performance, and .06 with combat performance. Clearly there was a technical/managerial combination which emphasized the combat support aspects of the technical exercises and the technical/managerial aspects of the administrative exercises. One task which involved combat staff operations (Day 3) confirmed this interpretation, correlating .31 with technical duty performance, .21 with combat duty performance, and .08 with administrative duty performance. The factor analysis of the OEC identifying

OFFICER EVALUATION CENTER SITUATIONAL TESTS
DAY ONE: MAAG Office--Peacetime

Time	
0730 (T)	Inspect 3 MAAG vehicles for combat readiness; recommended or take actions to correct deficiencies
1030 (A)	Correct poor supply records of Host Nation Army unit; explain errors to unit's antagonistic CO
1330 (T)	Check for bugs in communication network display for visit of Host Nation VIP; recommend or make corrections
1630	Supper
1745 (A)	Evaluate report on personnel office of Host Nation Army unit; recommend changes in organization & work flow
1945 (A)	Study production records of Host Nation ordnance platoon; reschedule work assignments of repairmen
2230	To BOQ

HOST NATION INVADED WITH NUCLEAR STRIKES
DAY TWO: MAAG Office--Wartime

0300 (T)	By radio, direct 4 jeep-mounted survey teams on Host Nation terrain reporting road damage, radiation levels, & other conditions
1200 (T)	Evaluate captured foreign weapon brought back by one of survey teams
1330 (A)	Study Host Nation map to select new depot sites; defend selections of depot sites made by MAAG CO
1630 (A)	On map, select new highway net to carry materiel from chosen depot sites to forward supply points
1900 (T)	Evaluate potential hasty airstrip sites & compute runway length
2000	To BOQ

SITUATION DETERIORATES
DAY THREE: Guerrilla Operations

0030 (C)	Evacuate MAAG Hq Office; trucked to woods; 5-mile night-march through woods to MAAG Field CP
0330 (C)	In bunker, prepare Company March Order to move friendly guerrilla unit
0700 (C)	Prepare roadblock, first instructing NCOs in placing demolitions on trees to form abatis
0900 (C)	With NCOs (one is unmanageable), recon Helicopter LZ & plan deployment of platoon in its defense
1000 (C)	From prepared Observation Post, report enemy activities and potential targets
1100	Lunch
1130 (C)	Lead route recon patrol in jeep; captured, interrogated, released, & returned to US control
1430	CEASEFIRE: FOREIGN NATIONALS LEAVE HOST NATION

Figure 3. Three days' activities in Officer Evaluation Center (OEC). (T • Technical/ Managerial, A • Administrative, C • Combat)

combat leadership and technical/managerial leadership as the principal components of military leadership is thus confirmed. This is an especially useful finding as it is based on actual duty positions in the field.

Aside from providing practical applied products, which have been responsive to the four goals of the Army research program listed earlier in this paper, this research effort made it possible to get better insight into the important dimensions of management leadership behavior in an aptitude/treatment interaction mode or in a systems measurement bed framework by emphasizing analysis of the realistic, content-valid, specific actions recorded, observed, and evaluated during the officer evaluation center simulation. Figure 4 represents the definition of this Army management leadership behavior as delineated by eight general factors. The factor structure reveals fairly good differentiation between the combat and technical/managerial domains of management leadership. You will note in Figure 4 that we can readily identify four quandrants of the model. The quadrants to the right of the figure deal with dimensions related to management leadership in combat. The quadrants to the left tend to deal with management leadership related to technical/managerial performance. The upper two quadrants deal with dimensions in which the individual management leader accomplishes his objectives through his team or through other men and women. Dimensions in the quadrants on the lower part of the figure, although important for exercising effective operational leadership, represent individual behaviors which may depend on personal knowledge, capability, and resourcefulness in order to achieve the mission.

A most intriguing dimension that emerges from these research data, sitting astride all four quadrants, is mission persistence--behaviors representing dogged persistence in carrying out orders and willingness to devote effort and to risk personal safety to achieve the goal. The officer accepts his role as an instrument in pursuing mission goals, and this attitude runs through diverse behaviors in different situations--establishing a roadblock, keeping combat reconnaissance teams going, resisting enemy interrogation. This leadership style is also characterized by bearing and assurance and consideration of men, including discipline as required to protect the health and safety of the unit. Effective assignment of men also underscores commitment to mission goals through careful preparation for action. This factor did not belong predominantly in either the technical/managerial domain or the combat domain but generalized across tasks in both domains. The point is that if one were to look for a single dimension that seems to cut across managerial leadership--combat leadership, individual contribution, or contribution through accomplishing the mission objective through others--then this dimension, mission persistence, is the one. Further, this dimension did not readily get measured by the paper and pencil test of the experimental battery that was designed for differential predictions of these broad domains of leadership behavior.

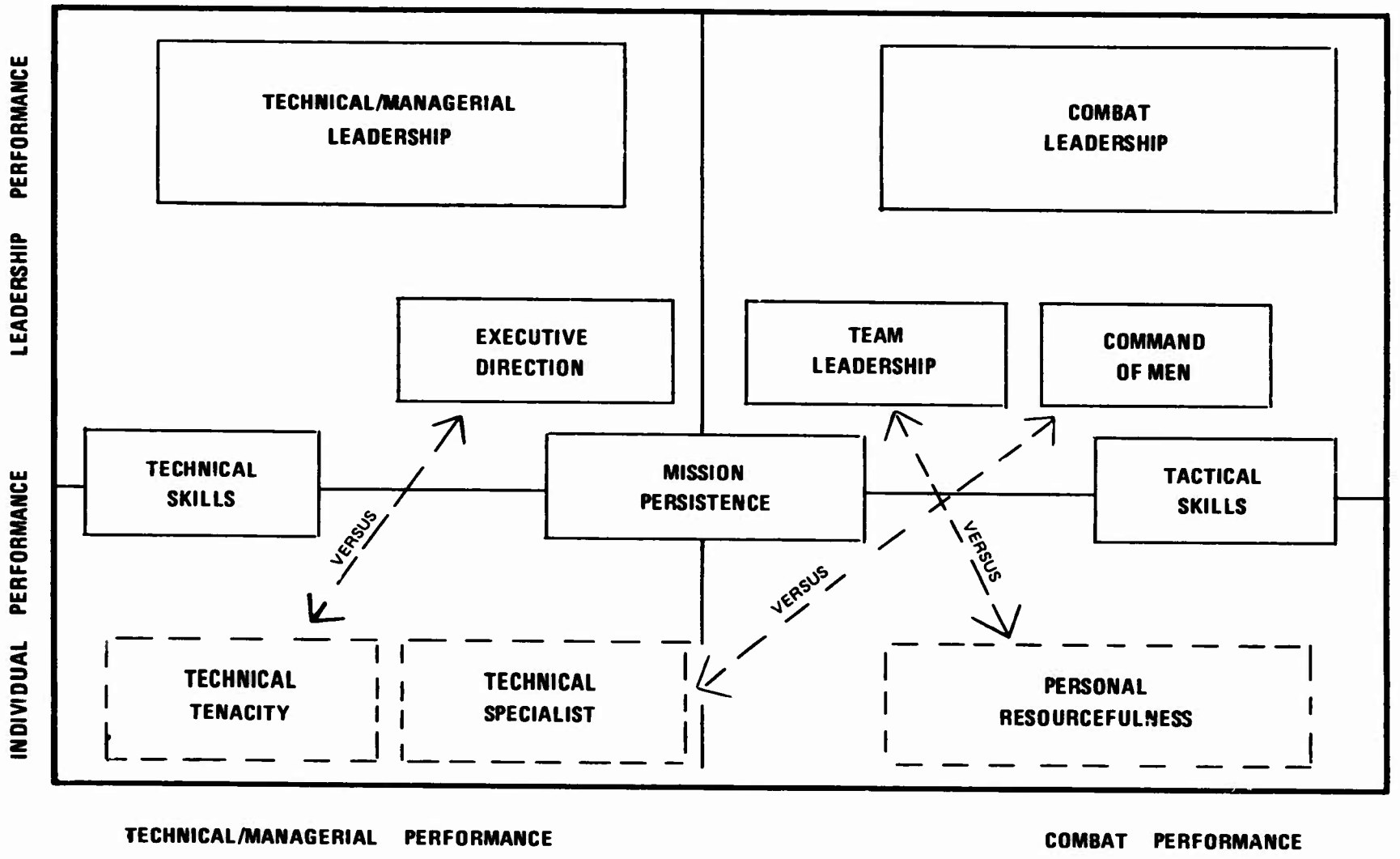


Figure 4. General factors of officer performance evaluated in simulated combat situation

What follows are the definitions of the various factors then constituting management leadership as found in officer behaviors by ARI.

MAJOR FACTORS IN OFFICER LEADERSHIP

Eight general factors are clearly delineated. Their structure reveals differentiation of the combat and technical/managerial domains of officer leadership. The first six factors are dominated by noncognitive aspects, while the last two are cognitive in nature.

FACTOR I -- TECHNICAL/MANAGERIAL LEADERSHIP. The first factor is definitely one of technical/managerial leadership, emphasizing effective problem solving in support of combat operations. Behavior is characterized by well-organized planning, reporting and follow-through under varying degrees of stress. A generally competent manner also appears which transcends the technical/managerial versus combat differentiation.

FACTOR II -- COMBAT LEADERSHIP. The second factor clearly reflects effective conduct of combat missions with the utilization of men and material appropriate to the given situation. Key behaviors are decisive response to emergencies, clear direction, and active example. The central combat effectiveness aspect of this factor is associated with forcefulness and assurance of manner coupled with consideration for men. The successful combat officer also relies on his knowledge of tactical matters and his skill in performing specific activities.

FACTOR III -- TEAM LEADERSHIP AS OPPOSED TO PERSONAL RESOURCEFULNESS. The third factor has a two-fold aspect. Teamwork-oriented behavior implies accepting personal responsibility for carrying out command missions, training and utilizing men, providing on-site security, understanding the mission, keeping cool, and reporting effectively to superiors. The other end of this bipolar factor is marked by self-reliance; the individual displays courage, endurance, and personal commitment--willingness to drive on alone in difficult and even dangerous situations. In other words, this factor represents a continuum from reliance on oneself to reliance on the team to accomplish the objective. At best, reliance on oneself is leadership by example only; reliance on the team involves effective deployment and utilization of men.

FACTOR IV -- COMMAND OF MEN. This aspect of combat leadership suggests a commander effectively employing men as contrasted to one who functions as a technical specialist in individual staff work. Components of the command aspect are command and control in a field operation, timely decision making, face-to-face leadership of men in combat and motivating men to accomplish the mission. Technical jobs in several different areas--automotive inspection, assessing a captured weapon, computing radiation levels, selecting depot sites--are components of the technical specialist end of the factor.

FACTOR V -- MISSION PERSISTENCE was defined and discussed previously.

FACTOR VI -- EXECUTIVE DIRECTION. On the one hand, this factor suggests a picture of the military leader operating in a variety of situations--combat security mission, selection of depot sites, assessing damage from enemy action, and the like--all tasks requiring decisive and timely action as well as organizing ability, endurance, and maintenance of technical competence under stress. Where face-to-face contact is of prime importance, effectiveness seems to depend on perseverance and oral communication in a generally favorable impression on subordinates, peers, and superiors. At the other end of this continuum is individual technical tenacity in which the officer applies decisiveness, organizing ability, and special knowledge in solving technical/managerial problems on his own rather than through the organizational structure.

On the basis of previous research, it has been hypothesized--and the hypothesis was borne out--that the performance of the combat leader could be influenced in large part by the noncognitive aspects of his behavior--forcefulness, risk-taking, decisiveness, and the like. What the present analysis demonstrates is the extent that specialized cognitive abilities also enter into officer performance in both combat and noncombat situations. The combat officer relies on his knowledge of tactical matters and his skill in performing specific activities in carrying out his mission. How he applies his knowledge and skills is influenced by his general mode of action, his system of values, and his attitude toward subordinates and peers and toward the mission objective--all this as brought to bear in a particular environment. To the officer in a technical/managerial activity, his technical skills--the cognitive element--are basic to performance. Beyond these abilities, his success in his assignment is a function of his skill and perseverance in directing the work of his command, his poise under emergency demands, and--in common with the combat leader--his persistence in completing his mission.

Thus, the seventh and eigth factors emerging from the analysis both demonstrate the differential requirements of combat and technical/managerial duties and at the same time point to the common requirement for cognitive abilities--different in knowledge content though these may be.

FACTOR VII -- TACTICAL STAFF SKILLS. This factor in the effectiveness of the combat leader depends on the effective application of specialized knowledge and skills in combat operations--how to deploy troops, use or set up networks of facilities, use or set up combat zone communications.

FACTOR VIII -- TECHNICAL STAFF SKILLS. A major aspect of technical/managerial performance involves use of specific knowledge and skills in logistics and technical services in support of combat activities. This factor is characterized by practical application of knowledge of material in a setting requiring effective staff relations.

Factors which have arrows connecting them are indeed of interest. One way to conceptionalize such factors is to recognize that when you are working individually and solving your own technical problem with technical

tenacity, or using personal resourcefulness on an individual basis, you are not likely to expand your energy at the same time to direct others or command others in the execution of that particular task. You could look at these factors as competitive behaviors for the same individual or the individual management leader. He may either have great individual skill or lack such skill, or be able to balance the relative allocation between individual task performance and supervising tasks and people for particular situations. Here again we have a very good example of aptitude/treatment interaction perhaps only meaningful and explainable in a systems measurement framework.

As we look at the next phase of results, which test the initial hypothesis of differential prediction as tested by the extent to which the differential officer battery scores are associated with differential performance in the measurement test bed (OEC exercise) and success in combat and technical/managerial assignments, we probably have somewhat controversial conclusions. The officer leadership factors derived from the paper and pencil predictors of leadership performance and those derived from specific OEC performance success in situations yield correlation coefficients from the higher teens to the lower twenties. A very critical question that has to be asked is whether all of the questions in the DOB can be effectively substituted for the OEC type of assessment; also, if this is to be done, which specific measures of the DOB should be employed. A fairly detailed report [6] issued last year dealt with this question and I will only concern myself here with very selected conclusions from that effort. Leadership performance in combat simulations was predicted primarily by combat and practical military knowledge of tactics and technology and by a set of motivational variables, but in my opinion, to a rather modest degree of usability. The most significant finding in this analysis is that the motivational variables predicted these combat leadership behaviors better than did the cognitive measures, although admittedly only slightly better.

Leadership performance in the measurement test bed for technical/managerial situations was predicted primarily by general-knowledge/verbal-information measures characterizing personnel staff activities and by scientific and technical information measures in the more technical activities in general. The major finding is the predominance of cognitive predictors in contrast to the stronger role of motivational predictors in the combat command situations.

My general conclusion is that when we are forced to save money for evaluation and prediction, the paper and pencil measures identified in this major research setting are useful, but not nearly as useful as the

---

[6] Helme, W. H., Willemin, L. P., and Grafton, F. C. Prediction of officer behavior in simulated combat situation. ARI Technical Research Report 1182. March 1974. (NTIS No. AD 730 315)

evaluation and conditions provided in the systems measurement test bed (the OEC). Taking into account the findings of this series of studies, with emphasis on the OEC studies, and considering the recent importance given to the interactions between variables, as discussed by Cronbach, the more fruitful applications toward organizational effectiveness or cost-effective accomplishment of missions, in my opinion, will derive from methodologies in which these interactions can be specified and studied, preferably in a systems measurement bed. Further, when you approach the research problems from a utilitarian point of view, it becomes easier to delimit the number of interactions to be addressed than is the case with the basic researcher. He tends to address innumerable interactions in any particular area of study. A framework which for me pulls together rather neatly many of the requirements critical for useful application derives from my previously published discussion of the systems measurement research methodology.[7]

For the system to function properly the subject-matter expert must be involved (in our case the military expert) to provide benchmark judgments of criterion values or dimensions of possible concern to him in the execution of important missions. For example: It is the military expert, working together with the behavioral research scientists, who could provide usable and needed degrees of accuracy, completeness, and timeliness of information extracted from military sources that he would consider useful in withstanding and dealing with threats. Even moderator variables may be estimated by the expert, such as specifying reasonable limits of probabilistic risk-taking (from his vast previous experience) to be put into a test bed against which SELECTED interactions can be examined.

As an example of two classes of variables where these interactions, after research, would lead to implications for selection, training, and development of management leadership, let me offer the following: It is clear, from the studies discussed thus far, that one class of variables deals with measured aptitude and ability of management leaders. In fact, a set of measures was indeed identified by research as more effective in predicting combat-like performance in both cognitive and noncognitive domains; similarly, a set was identified for technical/managerial activities. The second class of variables, well established in a number of studies at ARI and elsewhere, identifies style of management. Again it is feasible and reasonable to measure style as being most like "initiating structure," also known as directive style ("Benign Authoritarian" in Figure 1), or more like consideration, participative management, or human relations ("Democratic" in Figure 1). Further, I propose that

---

[7] Uhlaner, J. E. Human Performance, Jobs, and Systems Psychology--The Systems Measurement Bed. ARI Technical Report S-2. October 1970 (Reprinted January 1975). (NTIS No. AD 716 346)

style of management is trainable, and, in the Cronbach sense, can be thought of as a "traditional variable." Now, of interest for the reasons given in my earlier paper, a design of an experiment which examines differential effectiveness of management leaders as a function of aptitude/treatment interactions (style of management transactions) becomes significant in terms of application for selection, development of leadership and differential assignment. Suppose the analysis shows that high ability (cognitive domain) in the substantive aspects of the job, together with directive style, results in far greater effectiveness of the team than matched high ability with participative style. The implications are self-evident.

Or supposing we match on low ability and interact with style, and it turns out that low cognitive ability with directive style gives less effectiveness. Again, the implications are self-evident: By all means, if you are forced to staff with relatively low cognitive ability individuals, at least provide high potential human-relations capability.

Each of the interactions discussed above can be further subdivided with respect to other variables, e.g., the kinds of situation in which manager leadership takes place. The present studies suggest that a division between combat-like situations and technical/managerial situations would be profitable.

For the applied setting then, it is my repeated contention that for maximum usefulness the research scientist must depart from the preoccupation with the co-variance of abstract measures or the painstaking experimental study of variables in the independent/dependent mode. Abstract, theoretical research, though often intellectually rewarding, often yields little in the way of practical knowledge for application. The systems measurement bed discussed in this paper, with emphasis on criterion inputting by the user expert and with a methodological emphasis on study of selected interactions of utilitarian variables, will provide a particular segment of society, in this case the military, with usable findings. The psychometric heritage of measurement techniques has provided such concepts as construct validity and predictive validation. The experimental heritage has provided a better conceptualization of dependent/independent variables. It is time to take advantage of interactions between these two disciplines, embedding the work in a systems measurement bed in which the variables can be studied in relation to desired, specified outcomes, and thus applying a more reality-based methodology to the study of management leadership and human performance in systems situations.